



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

California Fleets and Workplace Alternative Fuels Project

2014 DOE Vehicle Technologies Office Review Presentation

Damian Breen

Deputy Air Pollution Control Officer
Bay Area Air Quality Management District



Overview

Timeline

- Project start date: February 1, 2013
- Project end date: January 31, 2015
- Percent Complete: 50%

Budget

Total Project Funding

- DOE Funding - \$1 million
- Air District match - \$100,000

Funding Received

- FY13 - \$7,897
- FY 14 - \$213,846
- Percent of Funds Spent to Date: 22.2%

Barriers

- Consumer reluctance to purchase new technologies
- Consumers and local government lack of technical experience with new fuels and vehicle technologies

Partners

- South Coast AQMD, CCSE
- Calstart, CaPEVC, CaFCP
- All 13 CA Clean Cities Coalitions (CCC)
- Advanced Transportation Technology and Energy (ATTE)/training facilitators in each of the 13 CCC regions



Relevance

Objectives

- Eliminate barriers to the deployment of alternative fuel vehicles and infrastructure at California workplaces and in California fleets
- Link California Air Resources Board (ARB) Advanced Clean Car and Clean Fuels Outlet regulations and the California Energy Commission (CEC) Alternative and Renewable Fuel and Vehicle Technology Investment Plan with California's employers and fleets

Project Supports VTP Deployment Goals

- Support DOE's strategic goal of protecting the U.S. national and economic security by reducing imports and promoting a diverse supply of reliable, affordable, and environmentally sound energy.
 - By 2020, to achieve a petroleum reduction of over 2.5 billion gallons per year through voluntary adoption of alternative fuel vehicles and infrastructure.
- Ease market introduction of alternative fuels and new electric drive vehicle technologies through voluntary efforts in partnership with local communities
- Provide technical and educational assistance to support local communities and partnerships that promote better understanding of the benefits of these new technologies



Milestones

Task	Date
Year 1	
PEV Statewide Forums	June 2013
Statewide CEO Level Workshops	September 2013 & May 2014
Training Assessment and Report	December 2013
Go/No-Go Decision Point	January 2014
PEV Website	March 2014
Year 2	
PEV Total Cost of Ownership Calculator	March 2014
Hydrogen Website	March 2014
Best Practices for Hydrogen (Cities/Counties & Fleets)	April 2014
Best Practices for Natural Gas (Cities/Counties & Fleets)	April 2014
Best Practices Workshops	May 2014
Training	June 2014 - January 2015
One-on-One Assistance to Fleets 2015	June 2014 through January



Approach: Safety and Training Initiatives

Training Assessment

- Assess existing alternative fuels training offered in California
- Assess need for additional training



Assessment Report

- Conduct analysis and prepare draft on initial findings
- Deliver draft assessment to DOE
- Complete in-depth follow-up for fleets and first responders
- Develop recommendations with industry partners
- Prepare and deliver final assessment
- Engage with ATTEs and industry partners to distribute Report
- Incorporate findings in Best Practices



Additional Training

- Prepare training courses based on identified needs and deliver training course materials and strategies to DOE
- Conduct trainings and provide DOE with report on training



Approach: Barrier Reduction Initiatives

Statewide CEO Level Workshop

- Prepare RFP for workshop consultant and select consultant
- Establish logistics for workshops and invite attendees
- Conduct workshops and deliver report to DOE

PEV Statewide Forums

- Identify “early adopter” employers to work with and conduct 2-3 forums statewide
- Define list of top 6 policies and incentives needed for employees to adopt EVs
- Deliver draft report to DOE on forums and best incentives, receive input, and prepare final report to DOE

PEV Total Cost of Ownership

- Gather input for data and input into PEV calculator
- Receive input on test calculator, develop final calculator, and deliver to DOE

Best Practices Hydrogen and Natural Gas - Fleets

- Review existing “practices”
- Receive input from stakeholder
- Compile “Best Practices” toolkit

Best Practices Workshops – Fleets and local governments

- Develop logistics for workshops
- Invite attendees and provide agenda and logistics
- Conduct workshops/outreach to individual fleets and deliver reports to DOE



Approach: Policy Initiatives & Market Development/Outreach Initiatives

- **Policy Initiatives**

- Best Practices Hydrogen and Natural Gas - Cities/Counties**

- Review existing “practices”
 - Compile “Best Practices” toolkit and deliver draft to DOE
 - Receive input from stakeholder
 - Prepare final draft of “Best Practices” toolkit and deliver to DOE

- **Market Development/Outreach Initiatives**

- PEV and Hydrogen Websites**

- Develop mock-up of website and provide to DOE
 - Post final website and monitor site
 - Provide DOE with final website design

- Deliver Workshops to Fleets and local governments on best practices**

- Develop logistics for workshops
 - Invite attendees and provide agenda and logistics
 - Conduct workshops and deliver report to DOE

- One-on-One Assistance to Fleets**

- Conduct one-on-one assistance to fleets and report to DOE



Accomplishments: Safety & Training Initiative

Training Assessment Report

- Report meets Safety & Training Initiative project objective
- Report details availability of safety and technical training on alternative fuel vehicles for emergency personnel and transportation fleet staff
- First responder survey - 52% of respondents not offering training – lack of funding and time main barriers
- Fleet managers indicated training is not a barrier (however, training preferred with new vehicles and vehicles coming off warranty)
- Report provides recommendations for fleets, fleet training organizations and Clean Cities Coalitions





Accomplishments: Barrier Reduction - CEO Level Workshop

- Workshop held to meet barrier reduction initiative
- Workshop branded as Drive the Dream - led by PEV Collaborative
- Held in San Francisco and attended by Governor Jerry Brown and 40 Fortune 500 Executives
- Corporations committed to 2,033 chargers and 1,509 PEVs by September 2014.





Accomplishments: Barrier Reduction - CALSTART

- **Outreach Initiative:**
 - Developed and launched the PEV Workplace Charging website in late September 2013, at www.evworkplace.org
 - Website focuses on employer, company and fleet solutions to PEV adoption and charging.
- **Barrier Reduction:**
 - Developed draft PEV Calculator for employers interested in installing workplace charging
 - Estimates installation and operations cost
- **Barrier Reduction:**
 - Conducted two meetings with employers (May 28 & June 25, 2013) interested in developing best policies and incentives for workplace charging.



Accomplishments: Barrier Reduction - SCAQMD

Barrier Reduction: California Fuel Cell Partnership prepared a draft of the Hydrogen Best Practices Guidelines on permitting and installation of hydrogen infrastructure.

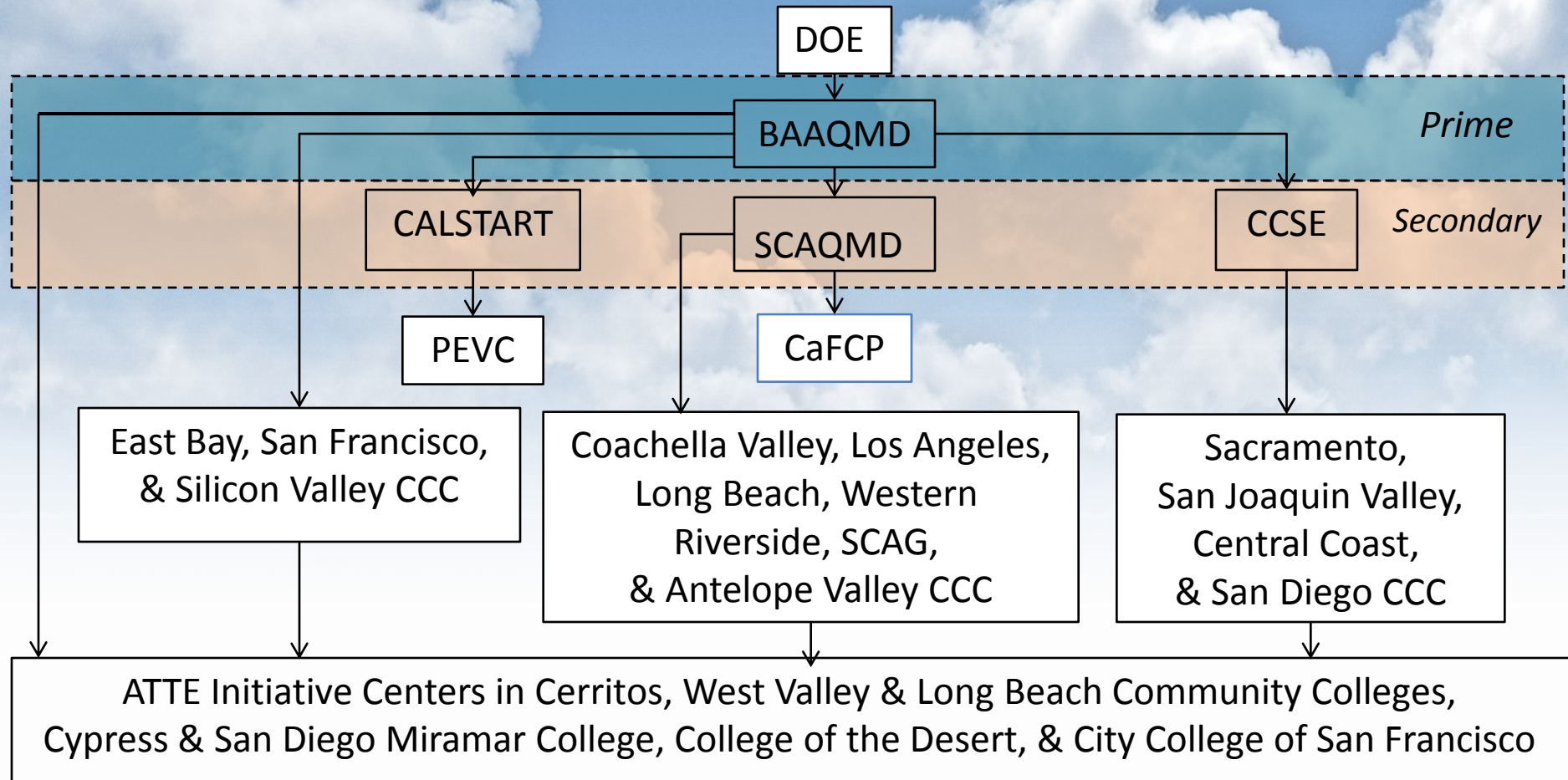
Barrier Reduction: SCAQMD subcontractors prepared a draft of the CNG/LNG Best Practices Guidelines

Barrier Reduction:

- Hosting ACT/Expo in Long Beach CA (May 5-8, 2014) to present the Best Practices Guidelines for Hydrogen, CNG/LNG, and PEVs
- PEVs Best Practices are not part of the DOE contract but have been developed separately by the BAAQMD under a separate contract



Collaboration and Coordination with Other Institutions



BAAQMD- Bay Area Air Quality Management District, SCAQMD – South Coast Air Quality Management District, PEVC – Plug-in Electric Vehicle Collaborative, CaFCP – CA Fuel Cell Partnership, CCSE – CA Center for Sustainable Energy, ATTE - Advanced Transportation Technology & Energy



Alternative Fuel Market Expansion Potential

Remaining Project Activities

- Finalize Hydrogen and CNG/LNG Best Practices
- Present Best Practices at ACT/Expo in May 2014 to local governments, fleet managers, and employers
- Following the release of the Best Practices, CCCs will receive a training workshop on the Best Practices and will in turn provide workshops to the local governments and fleets in their respective regions
- ATTEs, or other designated trainers, will use the information in the Best Practices Guidelines to train technicians and first responders in their respective regions
- One-on-one assistance for fleets from the CCCs will be ongoing upon release of the Best Practices and will continue through the end of the project and beyond



Summary

1. **Safety and Training Initiatives:**

- a. Training assessment and report completed December 2013
- b. Contracting with ATTEs to provide training to be completed in May 2014

2. **Barrier Reduction Initiatives:**

- a. Statewide CEO workshop held September 2013 – 2nd scheduled for May 2014
- b. Two PEV statewide forums held in May and June 2013
- c. PEV Total Cost of Ownership calculator is in final draft form
- d. Fleet Best Practices for Hydrogen, Natural Gas and PEV drafted - workshops in June 2014

3. **Policy Initiatives:** Local government Best Practices for Hydrogen, PEV & CNG/LNG drafted

4. **Market Development/Outreach Initiatives:**

- a. PEV website launched September 2013
- b. Hydrogen website under construction
- c. One-on-one assistance to fleets to commence June 2014



Responses to Previous Year Reviewers' Comments

This is the first year that this project has been reviewed. Therefore, there are no comments from previous years.



Technical Back-up Slides

Technical Back-up Slides Divider



Draft PEV Total Cost of Ownership Calculator

Reviewer-Only Slides

General Information		
Gasoline Fuel Price	\$ 3.81	/gallon
Average Energy Cost (during business hours)	0.15	/kWh
Include Demand Charges?	Yes	
Demand Charges Costs	\$ 10.00	/kW

*Reminder: this calculator is a work in progress.
We want your feedback and comments in order
to refine and improve later versions.*

Copyright ©2014. CALSTART. All Rights Reserved.
For private evaluation purposes only. Not for resale.

Employee Vehicles Information	
Employee #1 PHEV/EV model	Chevrolet Volt
Employee #1 Commute Distance to Work	8
Employee #1 PHEV/EV Charging Level	Level 2 (240V, 30A)
Employee #1 PHEV/EV Time to Reach Full Charge	2 hour(s)
Employee #2 PHEV/EV model	Chevrolet Volt
Employee #2 Commute Distance to Work	41
Employee #2 PHEV/EV Charging Level	Level 2 (240V, 30A)
Employee #2 PHEV/EV Time to Reach Full Charge	6 hour(s)
Employee #3 PHEV/EV model	Nissan LEAF
Employee #3 Commute Distance to Work	35
Employee #3 PHEV/EV Charging Level	Level 2 (240V, 30A)
Employee #3 PHEV/EV Time to Reach Full Charge	5 hour(s)
Employee #4 PHEV/EV model	BMW i3
Employee #4 Commute Distance to Work	56
Employee #4 PHEV/EV Charging Level	Level 2 (240V, 30A)
Employee #4 PHEV/EV Time to Reach Full Charge	4 hour(s)
Employee #5 PHEV/EV model	Chevrolet Volt
Employee #5 Commute Distance to Work	0
Employee #5 PHEV/EV Charging Level	Level 2 (240V, 30A)
Employee #5 PHEV/EV Time to Reach Full Charge	0 hour(s)

Initial charging infrastructure cost	\$ 8,000.00
Monthly operating cost (energy and demand charges)	\$ 320.10
Yearly operating cost (energy and demand charges)	\$ 3,915.75

To recover half of the operating costs, you will need to charge monthly	\$ 40.8	per vehicle
Equivalent to the monthly fuel costs of a vehicle with a fuel economy of	64	MPG
To recover all operating costs, you will need to charge monthly	\$ 81.6	per vehicle
Equivalent to the monthly fuel costs of a vehicle with a fuel economy of	32	MPG

How many years to recover initial charging infrastructure cost?	5	years
To achieve the desired payback, you will need to charge monthly	\$ 33.3	per vehicle
Equivalent to the monthly fuel costs of a vehicle with a fuel economy of	78	MPG



Draft Guidance to PEV Total Cost of Ownership Calculator

Reviewer-Only Slides

USER GUIDE: CALSTART Workplace Charging Calculator

CALSTART's intent in developing this Workplace Charging Calculator is to provide employers and employees a simple and useful planning tool that can help them make informed decisions about electric vehicle workplace charging. Like its partner tool, the Best Practices for Workplace Charging (available at: <http://evworkplace.org/wp-content/uploads/2013/10/Best-Practices-for-Workplace-Charging-CALSTART.pdf>), this calculator was developed to promote adoption of Plug-in Electric Vehicles and specifically focuses on solutions for charging infrastructure at the workplace.

This calculator is a great tool to visually show if workplace charging can be a success for you, whether you are an employer interested in installing EV chargers or an employee desiring to use a plug-in electric vehicle to commute to / from work.

If you wish to explore further, we recommend trying the following calculators to decide if electric vehicles are right for you:

Fuel Economy

<http://www.fueleconomy.gov/>

The official U.S. government source for fuel economy information.

Pacific Gas & Electric / Plug-in Electric Vehicle Calculator

<http://www.pge.com/cgi-bin/pevcalculator/PEV>

Provides an illustration of potential costs and savings associated with a plug-in electric vehicle based on manufacturer's specifications.

Sacramento Municipal Utility District / Electric Vehicle Calculator

<http://c03.apogee.net/content/player/?utilityid=srud&courseid=misc&id=18862>

To help you decide which electric vehicle is right for you.

South Coast Air Quality Management District / Clean Air Vehicle Calculator

<http://cleancarchoices.org/#>

It compares driving a 2012 or 2013 clean vehicle model to an average gasoline-powered vehicle (using the EPA's Annual Fuel Economy Trends Report average).

Southern California Edison / Electric Vehicle Rate Assistant

https://www.sce.com/wps/portal/home/residential/electric-cars/rates-charging-options/EV-Rate-Assistant?uri=/p/b0/04_S9CPyKssy0xPLMnMz0vMA6GzOK9PF0cDd1NjDwmB3ND8WtAh3NTL0DjZwtiPOLsh0VAxM9RqEI/

Use this quick and easy tool to understand the right rate plan for you and learn how to save on your electricity bill when charging an electric vehicle.

University of Santa Barbara – Institute for Energy Efficiency / Clean Car Calculator

<http://ee.ucsb.edu/CleanCarCalculator/#UwUHjVhZCg>

Find out if buying a high-efficiency vehicle can save you money by answering a few simple questions.

This user guide is laid out quite simply – it provides an explanation of all the fields in the calculator, guiding you on which ones you can enter data into, and where to find guidance information for fields where you are not yet sure of your own data. At each stage, we also share with you the assumptions built into the calculator's function.

Page 1 of 5

• Gasoline fuel price

The default value is the weekly California midgrade gasoline price from the U.S. Energy Information Administration (EIA) weekly gasoline and diesel fuel update.¹ We recommend you visit the Energy Information Agency web site for the latest fuel prices. For your information, the table below presents an example of midgrade gasoline fuel prices from the EIA as of February 19, 2014:

U.S. Midgrade Gasoline Fuel Prices	\$ / gallon
U.S.	3.555
East Coast	3.598
New England	3.704
Central Atlantic	3.684
Lower Atlantic	3.522
Midwest	3.509
Gulf Coast	3.357
Rocky Mountain	3.362
West Coast	3.720
West Coast less California	3.496
California	3.810

Source: U.S. Energy Information Administration (EIA)

• Energy cost

The default value is the California average commercial or residential retail price of electricity to ultimate customers.² We recommend you visit the Energy Information Agency web site for the latest electricity prices. For your information, the table below presents the average commercial and residential retail electricity prices from the EIA as of November 2013:

Average Retail Price of Electricity to Ultimate Customers (¢ / kWh)	Commercial	Residential
U.S.	10.12	12.09
Massachusetts	14.23	16.05
New York	13.65	18.48
Ohio	9.35	11.88
Missouri	7.84	9.80
Florida	9.67	11.51
Kentucky	8.77	9.60
Texas	7.90	11.68
Colorado	9.96	11.65
California	14.67	16.80
Hawaii	34.61	37.24

Source: U.S. Energy Information Administration (EIA)

• Demand charges

Demand charges have been a surprise to some users, and in some few cases have been quite substantial. The rate structures that apply to commercial and industrial customers usually include a monthly demand charge based on the highest amount of power drawn by the facility. In the simplest case, the demand charge is based on the peak demand in a given month, usually averaged over a 15-minute period, no matter what time of day it occurs.³

¹ <http://www.eia.gov/petroleum/gasdiesel/>

² http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

³ From G. Masters, *Renewable and Efficient Electric Power Systems*, ISBN 0-471-28060-7, John Wiley & Sons, Inc., 2004

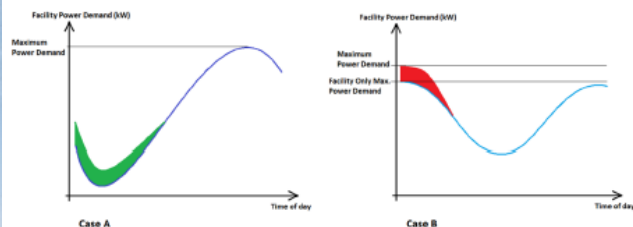
Page 2 of 5



Draft Guidance to PEV Total Cost of Ownership Calculator

Reviewer-Only Slides

The user has the possibility to include in the calculation the demand charges from electric vehicle charging. When they are included, we assume a "worst-case scenario" where the power demand from the electric vehicles is added to the maximum power demand of the fleet facility. For example, in case A below, electric vehicle charging occurs at night when the facility's power demand is low. Although, charging increases the facility power demand at night, it does not increase the maximum power demand for the day, and thus does not increase the demand charges. On the other hand, in case B below, the facility sees its maximum power demand at night. Charging electric vehicles at this time increases the maximum power demand for the day, and thus increases the demand charges as well.



From a scroll-down menu, the user can choose between 5 different demand charges prices, ranging from \$5/kW and \$25/kW. You do not need to build demand charges into your business case if you do some smart planning in advance of deployment to know how much energy the facility uses where you will be recharging your vehicles, and can avoid going over your peak demand.

- **PHEV / EV model**

The user can choose among 17 models of commercially available (as of early 2014) plug-in and battery electric vehicles (PHEV / EV):

Selected PHEV / EV Models	All-electric Range	Max. Charging Level	Battery Size
BMW i3	100 miles	7.4 kW	22.0 kWh
Cadillac ELR	35 miles	3.3 kW	16.5 kWh
Chevrolet Spark EV	82 miles	3.3 kW	20.0 kWh
Chevrolet Volt	38 miles	3.3 kW	16.5 kWh
Fiat 500e	87 miles	6.6 kW	24.0 kWh
Ford C-Max Energi Plug-in Hybrid	21 miles	3.3 kW	7.6 kWh
Ford Focus Electric	76 miles	6.6 kW	23.0 kWh
Ford Fusion Plug-in Hybrid	21 miles	3.3 kW	7.6 kWh
Honda Accord Plug-in Hybrid	13 miles	6.6 kW	6.7 kWh
Honda Fit EV	82 miles	6.6 kW	20.0 kWh
Mitsubishi iMIEV	62 miles	3.3 kW	16.0 kWh
Nissan LEAF	75 miles	3.3 kW	24.0 kWh
Porsche Panamera S E-Hybrid	22 miles	3.6 kW	9.4 kWh
Smart fortwo Electric Drive	68 miles	3.3 kW	17.6 kWh
Tesla Model S	265 miles	10.0 kW	85.0 kWh
Toyota Prius Plug-in	11 miles	3.3 kW	4.4 kWh
Toyota RAV4 EV	103 miles	10.0 kW	41.8 kWh

Page 3 of 5

- **Commute distance to work**

This is the number of miles a particular employee normally drives to get to work (in miles).

- **PHEV / EV charging level**

This is the charging rate a particular employee will recharge his/her vehicle at the workplace. Below are the 4 different charging levels available in this calculator:

Charging Level	Maximum Charging Power
Level 1 (120V, 12A)	1.44 kW
Level 2 (240V, 16A)	3.84 kW
Level 2 (240V, 30A)	7.20 kW
Level 2 (240V, 40A)	9.60 kW

- **Time to reach full charge**

This is the estimated time it will take to reach a full charge, given the estimated state of charge when the employee arrives at work.

- **Combined MPG of car to be replaced**

This is the combined fuel economy (city and highway) of the vehicle that the employee is looking at replacing by a plug-in electric vehicle.

- **Initial charging infrastructure cost**

This is the total cost to the employer to purchase and install the number of EV chargers necessary to charge the employee(s) plug-in electric vehicle(s).

- **Operating cost**

This is the monthly and yearly costs (including energy and demand charges) that the employer will incur to provide workplace charging for the employee(s) plug-in electric vehicle(s).

- **Monthly charge to recover half/all operating costs**

This is amount the employer needs to charge monthly to each employee using workplace charging to recover half or all of the monthly costs (including energy and demand charges) that the employer will incur to provide workplace charging for the employee(s) plug-in electric vehicle(s).

For information purposes, we provide the fuel economy of a conventional vehicle that would spend the same amount in fuel cost as the monthly charge.

- **Years to recover the initial charging infrastructure cost**

The user can choose to charge each employee using workplace charging to recover his initial charging infrastructure cost within the chosen number of years.

- **Monthly charge to achieve the desired payback**

This is amount the employer needs to charge monthly to each employee using workplace charging to recover his initial charging infrastructure cost within the chosen number of years.

- **Yearly saving for employee if employer doesn't charge for workplace charging**

This is the yearly amount an employee will save in fuel cost by driving a plug-in electric vehicle to work and using workplace charging at no cost.

- **Yearly saving for employee if employer charges the same or twice the price the employees pays at home for electricity**

This is the yearly amount an employee will save in fuel cost by driving a plug-in electric vehicle to work and using workplace charging at the same or twice the price the employee pays at home for electricity.

Assumptions:

We included a 90% efficiency correction to account for losses during charging.



Publications and Presentations

Reviewer-Only Slides

Publications/Websites:

- Needs Assessment for Alternative Fuel Vehicle Training in California, December 2013, Prepared by California Center for Sustainable Energy in association with California Clean Cities Coalition (post pdf on Air District website and provide link here)
- Drive the Dream <http://www.pevcollaborative.org/DRIVETHEDREAM>
- Employer EV Initiative Webinar, May 28, 2013, CALSTART
- Employer EV Initiative Webinar, June 25, 2013, CALSTART
- Draft PEV Website <http://evworkplace.org/#/>



Critical Assumptions/Issues

Reviewer-Only Slides

Critical Assumptions:

- Employers and fleets chosen as target market based on their ability to expand the market for alternative fuels
- Barrier to accelerated adoption of alternative fuels is:
 - Delays in permitting by local government agencies
 - Employers/fleets limited knowledge of installation/deployment
 - Limited support from CCCs of employers/fleets

Issues:

- Other markets (e.g. private fleets) will also need to be targeted
- Resources of local government agencies may not be sufficient to adopt developed policies
- Increased cost of alternative fuel vehicles/infrastructure



Questions

Lead:

Damian Breen

Deputy Air Pollution Control Officer

939 Ellis St, San Francisco CA 94109

(415) 749-5041 | dbreen@baaqmd.gov

Supporting:

Joseph Steinberger

Principal Environmental Planner

939 Ellis St, San Francisco CA 94109

(415) 749-5018 | jsteinberger@baaqmd.gov